



# Small & Intermediate Wind Opportunities and Issues in New England

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# Defining Characteristics of Small & Intermediate Wind

- Consumer owned and operated
- Not for bulk power
- Applications:
  - Grid connected, “behind the meter”
  - Wind/diesel “hybrid” power system
  - Stand alone

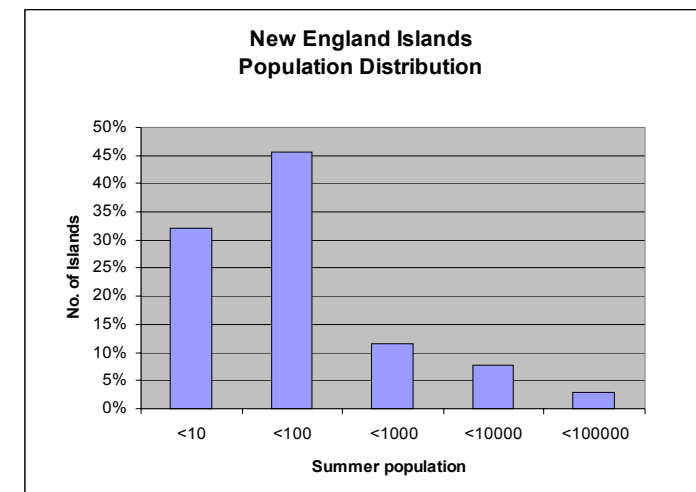
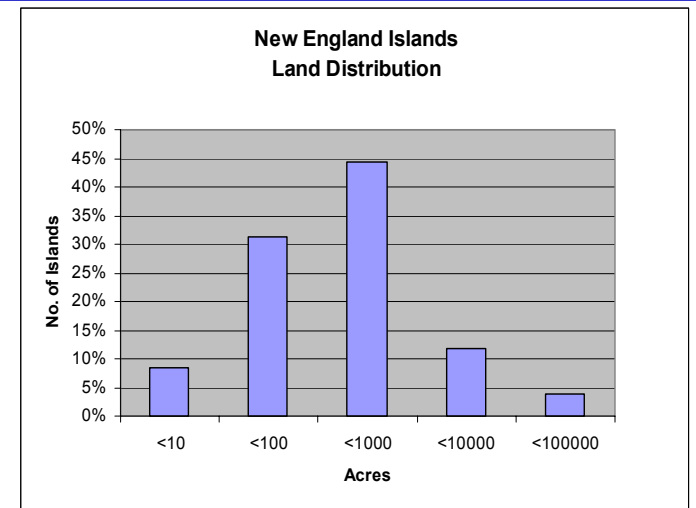


# Potential Locations

- Rural uplands
- Coasts
- Islands

# New England Islands

- More than 3,000 islands :
  - from Martha's Vineyard (70,000 acres) to Little Brewster Island (2 acres)
- > 200 islands with energy-consuming activities:
  - from entire communities to unmanned lighthouses
- Plentiful wind resource:
  - 6.5 m/s off Connecticut to 8.5 m/s off Maine



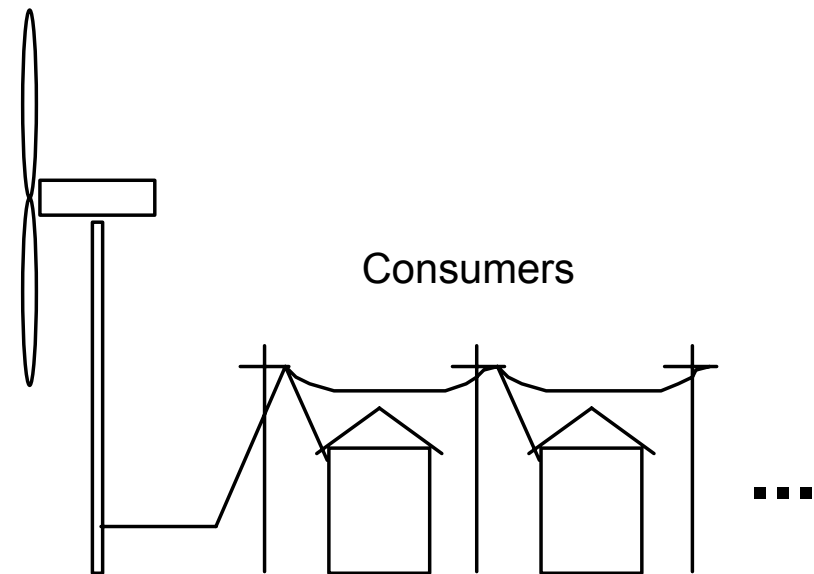


# New England Islands Classification

- Connected to mainland (15%)
  - Year round communities (e.g., North Haven, ME).
  - Summer only activities (e.g., Cross Island, MA)
- Isolated from mainland (85%)
  - Year round communities (e.g., Monhegan, ME).
  - Summer-only activities (e.g., Great Diamond, ME).
  - No population, but energy requirement (e.g., Matinicus Rock, ME).
  - Ecological preserves (e.g., Machias Seal Island, ME).

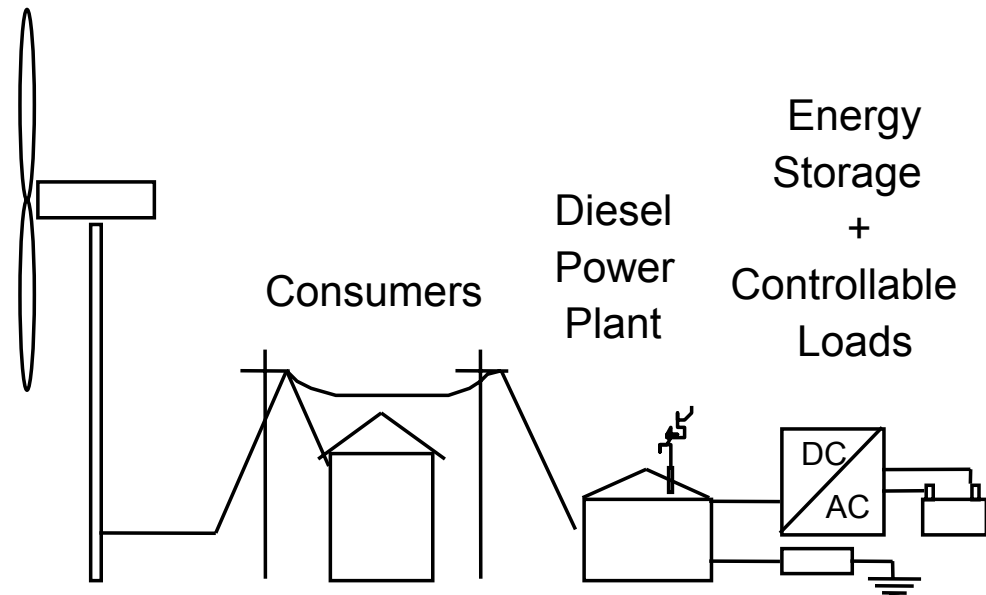
# Grid Connected Wind Systems

- Wide range of turbine sizes
  - $\sim 1$  kW to  $\sim 750$  kW
- Typical applications
  - Residential
  - Farms
  - Municipal utilities
  - Commercial/Industrial/  
Public
  - Brown fields



# Wind/Diesel Systems

- Larger islands
- No cable to mainland
- System:
  - Wind turbine(s)
  - Diesel generator(s)
  - Control system
  - Storage?
  - Heaters?

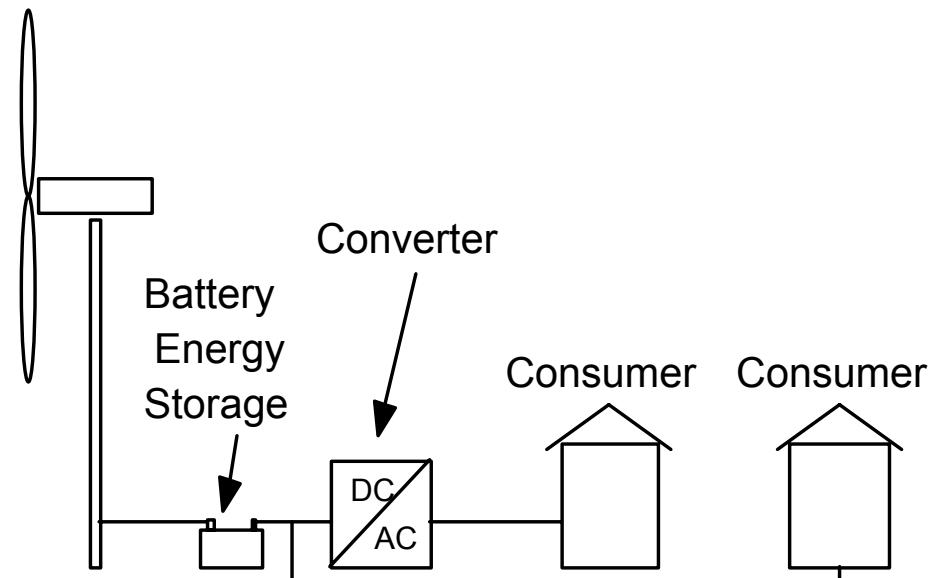


# Stand Alone Systems

- Small turbines, 200 W to ~15 kW
- Normally includes storage (batteries)

- Typical system:

- Turbine
- Battery
- Simple controls
- Pump?







# Issues: Attractions

- Perception of environmental/public benefit
- Economics
  - Cost of energy should be attractive
  - Absolute cost important
- Energy independence



# Issues: Concerns

- “Hassle factor”
  - Maintenance (tower climbing, etc.)
- Reliability
- Noise
- Aesthetics
- Neighbors
- Interconnection/backup power



# Issues: Obstacles

- Zoning
  - Height restrictions
  - Setbacks
- Permitting
  - Building permits
  - Conservation commission approval
  - Noise measurements
- Need for professional engineer's (P.E.) stamp

# Alternatives (1)

- Grid connected
  - Status quo
- Wind/diesel
  - Cable
  - Status quo



## Alternatives (2): Small Islands/Remote

- Electricity
  - Gasoline generators
  - Photovoltaic panels
- LP gas
  - Refrigerators
  - Hot Water
- Wood
  - Space heat
  - Hot tubs



# Observations/Recommendations (1)

- Economics
  - Net metering
    - Should help small, grid connected systems
    - Could be improved & expanded
  - Renewable Portfolio Standard (RPS)
    - Should help larger systems
  - Feed in tariff (c.f. Germany) worth considering
- Uniform standards for installation
  - California has model



## Observations/Recommendations (2)

- Realistic noise regulations
  - Uniform standards
  - Protection for neighbors
  - Fairness for would-be turbine users
  - Encouragement to manufacturers for quieter turbines
  - Requirement for turbine noise information
    - From independent source
    - At all wind speeds of interest



# Suggestions for Manufacturers

- Appealing design
  - Quiet
  - Handsome
  - Easy to install and maintain
- For remote sites:
  - Complete systems
    - Refrigeration
    - Heating
    - User friendly



# Conclusions

- Opportunities exist for small & intermediate turbines
- To facilitate more applications
  - Coherent permitting
  - Improved perceptions
  - User friendly systems
  - Simple incentives